

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A piezoelectric device for an injector, built into an injector and generating driving force of said injector, comprising:

a plurality of piezoelectric layers generating displacement in proportion to a voltage applied to said piezoelectric layers;

a plurality of internal electrode layers for supplying the applied voltage; and
said piezoelectric layers and said internal electrode layers being alternately laminated;

the composition of said piezoelectric layers ~~being comprising~~ a lead zirco-titanate composition, the components of said lead zirco-titanate composition being adjusted so that a relation $d(0.1 E_c)/d(1.2 E_c) > 0.43$ is established, where E_c is coercive electric field which causes the changing of polarizing direction, between an apparent piezoelectric constant $d(1.2 E_c)$ calculated from static elongation when an electric field of $1.2 E_c$ is applied to said piezoelectric device in the same direction as a polarizing direction while a preset load of 500N is applied to said piezoelectric device, and an apparent piezoelectric constant $d(0.1 E_c)$ calculated from static elongation when an electric field of $0.1 E_c$ is applied to said piezoelectric device in the same direction as the polarizing direction.

2. (previously presented) A piezoelectric device for an injector according to claim 1, wherein the components of the lead zirco-titanate composition

establish a relation $d(0.1Ec)/d(1.2Ec) \geq 0.5$ between said piezoelectric constant $d(1.2Ec)$ and said piezoelectric constant $d(0.1Ec)$.

3. (currently amended) A piezoelectric device for an injector, built into an injector and generating driving force of said injector, comprising:

a plurality of piezoelectric layers generating displacement in proportion to a voltage applied to said piezoelectric layers;

a plurality of internal electrode layers for supplying the applied voltage; and

said piezoelectric layers and said internal electrode layers being alternately laminated;

the composition of said piezoelectric layers ~~being comprising~~ a lead zirco-titanate composition, the components of said lead zirco-titanate composition being adjusted so that said piezoelectric device has a change ratio of displacement of 9% or below when a frequency of the applied voltage is changed from 1 Hz to 200 Hz under the state where an AC voltage is applied so that an electric field intensity of 0 to 1.5 kV/mm is generated by a sine wave while a preset load of 500N is applied to said piezoelectric device.

4. (previously presented) A piezoelectric device for an injector according to claim 3, wherein said change ratio of displacement is 7% or below.

5. (currently amended) A piezoelectric device for an injector, built in an injector and generating driving force of said injector, comprising:

a plurality of piezoelectric layers generating displacement in proportion to a voltage applied to said piezoelectric layers;

a plurality of internal electrode layers for supplying the applied voltage; and
said piezoelectric layers and said internal electrode layers being alternately laminated;

the composition of said piezoelectric layers ~~being comprising~~ a lead zirco-titanate composition, the components of said lead zirco-titanate composition being adjusted so that the displacement increases with the rise of temperature within the range of -40°C to 150°C.

6. (previously presented) A piezoelectric device for an injector according to claim 5, wherein the components of the lead zirco-titanate composition is adjusted so that said change ratio of displacement is 5 to 40% within the range of temperature of -40°C to 150°C.

7. (currently amended) A piezoelectric device for an injector, built in an injector and generating driving force of said injector, comprising:

a plurality of piezoelectric layers generating displacement in proportion to a voltage applied to said piezoelectric layers;

a plurality of internal electrode layers for supplying the applied voltage; and
said piezoelectric layers and said internal electrode layers being alternately laminated;

the composition of said piezoelectric layers ~~being comprising~~ a lead zirco-titanate composition, the components of said lead zirco-titanate composition being

adjusted so that said piezoelectric device has a dielectric loss of 8% or below calculated from a P-E hysteresis.

8. (currently amended) A piezoelectric device for an injector according to claim 7, wherein the components of said lead zirco-titanate composition ~~being~~are adjusted such that said dielectric loss is 7% or below.

9-30. (canceled)

31. (previously presented) A method of using a piezoelectric device to generate a driving force of an injector, the piezoelectric device having a plurality of piezoelectric layers and a plurality of internal electrode layers, the method comprising:
applying a voltage to the plurality of internal electrode layers;
generating displacement in the piezoelectric layers in proportion to the applied voltage; and

establishing a relation $d(0.1E_c)/d(1.2E_c) > 0.43$, where E_c is coercive electric field which causes the changing of polarizing direction, between an apparent piezoelectric constant $d(1.2E_c)$ calculated from static elongation when an electric field of $1.2 E_c$ is applied to said piezoelectric device in the same direction as a polarizing direction while a preset load of 500 N is applied to said piezoelectric device, and an apparent piezoelectric constant $d(0.1E_c)$ calculated from static elongation when an electric field of $0.1 E_c$ is applied to said piezoelectric device in the same direction as the polarizing direction.

32. (previously presented) A method according to claim 31, wherein a relation $d(0.1E_c)/d(1.2E_c) \geq 0.5$ is established between said piezoelectric constant $d(1.2E_c)$ and said piezoelectric constant $d(0.1E_c)$.

33. (previously presented) A method of using a piezoelectric device to generate a driving force of an injector, the piezoelectric device having a plurality of piezoelectric layers and a plurality of internal electrode layers, the method comprising:

applying a voltage to the plurality of internal electrode layers;

generating displacement in the piezoelectric layers in proportion to the applied voltage; and

wherein said piezoelectric device has a change ratio of displacement of 9% or below when a frequency of the applied voltage is changed from 1 Hz to 200 Hz under the state where an AC voltage is applied so that an electric field intensity of 0 to 1.5 kV/mm is generated by a sine wave while a preset load of 500 N is applied to said piezoelectric device.

34. (previously presented) A method according to claim 33, wherein said change ratio of displacement is 7% or below.

35. (previously presented) A method of using a piezoelectric device to generate a driving force of an injector, the piezoelectric device having a plurality of piezoelectric layers and a plurality of internal electrode layers, the method comprising:

applying a voltage to the plurality of internal electrode layers; and

generating displacement in the piezoelectric layers in proportion to the applied voltage;

wherein the displacement increases with the rise of temperature within the range of -40°C to 150°C.

36. (previously presented) A method according to claim 35, wherein said change ratio of displacement is 5 to 40% within the range of temperature of -40°C to 150°C.

37. (previously presented) A method of using a piezoelectric device to generate a driving force of an injector, the piezoelectric device having a plurality of piezoelectric layers and a plurality of internal electrode layers, the method comprising:
applying a voltage to the plurality of internal electrode layers; and
generating displacement in the piezoelectric layers in proportion to the applied voltage;

wherein said piezoelectric device has a dielectric loss of 8% or below calculated from a P-E hysteresis.

38. (previously presented) A method according to claim 37, wherein the dielectric loss is 7% or below.